IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appn. Number:	10/626,687
Filing Date:	07/23/2003
Applicant:	Hendon Whitworth
Examiner/ AU:	Not Assigned
Application Title:	Internal Screw Positive Rod Displacement Metering Pump
Agent Docket No.:	Whitwo.H-01

PETITION TO MAKE SPECIAL MPEP 708.02 (VIII)

Mail Stop: Petitions
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Commissioner for Patents:

Pursuant to 37 C.F.R. Section 1.102(d) and M.P.E.P. 708.02 VIII (Accelerated Examination), Applicant hereby files this petition in the United States Patent and Trademark Office to make special the prosecution in the above-identified case. This petition is based on the grounds that the claims in this application are believed to be drawn to a single invention, namely, a fluid metering apparatus and method (claims 1-7). However, if the Office determines that all claims presented are not obviously directed to a single invention, applicant will make an election, without traverse.

Applicant has conducted a pre-examination search in the following fields of search by class/subclass: 417/362, 44.2, 43, 22, 265, 210/767, 303/116.4, 92/136, and international classes F04B 9/02 and Gk01N 33/00. The relevant references found in this search are submitted herewith and are discussed below and it is pointed out with particularity, how the claimed subject matter distinguishes over these references. Based on the search results, it is applicant's opinion that all of the claims in this application are allowable.

The following abstracts of the references found in our preliminary patentability search are presented for reference in light of further remarks concerning distinctiveness of the instant invention.

Nichols et al., U.S. 4,089,624 describes a pumping system for dispensing controlled and variable amounts of fluids in predetermined quantities including a pump piston, which moves axially in a pump chamber. The piston is reciprocated by a drive lead nut cooperating with a non-rotatable lead screw attached to the piston. The piston is sealed to the pump chamber by a seal element whose distance from the lead nut is fixed regardless of the position of the piston, thus protecting the seal. The rotatably driven lead nut includes a hollow driven shaft, containing lubricant, so that the lead screw is lubricated as it travels into the shaft of the lead nut. The motor for the system is a pulse operated reversible stepping motor enabling accurate output from the pump, for example, between .01 ml/min to 9.99 ml/min as controlled by the stepping motor. One motor may drive two pumps for a continuous controlled pumping system. If desired a flush mechanism may be used to rinse the piston of any pumped material which adheres to the surface.

Hutchins et al., U.S. 4,245,963 describes a pump for precise, smooth delivery of liquid, particularly in liquid chromatography systems, featuring two liquid displacement elements mounted for reciprocating movement in chambers connected in series with two check valves, one displacement element serving to accumulate some of the liquid delivered by the first element and to deliver the accumulated liquid while the first element is refilling.

Patterson et al., U.S. 4,352,636 describes a pump for producing a substantially smooth and continuous outflow of liquid at relatively high pressure having two piston assemblies flow connected in series. The first piston assembly includes a pressure piston having a long suction stroke and a relatively short and abrupt expulsion stroke. A valve at the inlet of the pressurization piston allows flow to enter (but not exit), and a valve at the outlet of the pressurization piston allows flow to exit (but not enter). The second piston assembly includes a damper piston which functions as a mechanically driven damper to smooth the outflow from the pressure piston. This smoothing is accomplished by storing of the liquid displaced by the expulsion stroke of the pressure piston and then delivering the stored pressurized liquid to the pump outlet during the suction stroke of the pressure piston. The drive for the pistons is constructed to produce an increased outflow of pressurized liquid for a short interval at the beginning of the expulsion stroke of the pressure piston to compensate for

compressibility of the liquid at high pressure. At low pressure, the stepper motor drive is slowed down in response to the sensing of the increase of the outflow during this short interval to maintain the outflow smooth and continuous during this part of the cycle of operation.

Strohmeier et al., U.S. 4,883,409 describes a pumping apparatus for delivering liquid at a high pressure, in particular for use in liquid chromatography, comprising two pistons which reciprocate in pump chambers, respectively. The output of the first pump chamber is connected via a valve to the input of the second pump chamber. The pistons are driven by linear drives, e.g., ball-screw spindles. The stroke volume displaced by the piston is freely adjustable by corresponding control of the angle by which the shaft of the drive motor is rotated during a stroke cycle. The control circuitry is operative to reduce the stroke volume when the flow rate, which can be selected by user at the user interface is reduced, thus leading to reduced pulsations in the outflow of the pumping apparatus. The pumping apparatus can also be used for generating solvent gradients when a mixing valve connected to different solvent containers is coupled to the input of the pumping apparatus.

Snodgrass et al., U.S. 5,516,429 describes a fluid dispensing system which has first diaphragm pump means, a filter connected to receive the discharge of said first pump, and accumulator/second diaphragm pump means connected to receive the discharge of said filter. Hydraulic fluids pumped by cylinder/piston/stepper assemblies independently actuate each of the diaphragm pumps, providing accurate, controllable and repeatable dispense of the subject fluid.

Muratsubaki et al., U.S. 6,068,448 describes a high pressure hydraulic pump apparatus constituting a two-stage pressurizing hydraulic booster combining a pair of plunger pumps. The first and second pumps are driven into a push-pull synchronous operation at the equal stroke with each other. The per-stroke displacement of the first pump is greater than that of the second pump. The first pump draws by self-suction the liquid from a reservoir while the second pump is on the pressurizing and delivery stroke. When the first pump is on the delivery stroke, the liquid pressurized to a certain intermediate pressure by the first pump is

sucked into the second pump. During the next reverse stroke the second pump further pressurizes and discharges the liquid while the first pump effects the suction stroke. At the final pressurization by the second pump, the driving stroke length of the pump is controlled to a limited value, which provides a minimum delivery flow required for the interior of a load vessel to attain a target pressure in accordance with the compressibility of the liquid and the detection of a load pressure.

Ganzel, U.S. 6,079,797 describes a ball screw pump assembly including a pump body having an axial bore defining a travel chamber and a pressure chamber. An input port and an output port are formed in the pressure chamber. A ball screw is provided in the travel chamber. A piston is connected to the ball screw and slidably extends into the pressure chamber as the ball screw is rotated. The piston divides the pressure chamber into an input chamber having a maximum volume and an output chamber having a maximum volume which is less than the maximum of the input chamber. The ball screw pump assembly can be used in a vehicular braking system.

Eden et al., U.S. 6,510,780 describes a reversibly actuatable fluid hydraulic pump for use in a hydraulically driven elevator. The pump comprises a cylinder and a piston linearly actuatable within the cylinder by a ball screw race disposed over a spindle and connected to the piston. The shaft of the piston is hollow to receive the spindle as the piston is drawn along by virtue of the motion of the race along the spindle, and seals are provided at the free end of the piston which sealingly engage against the walls of the cylinder, and on the cylinder which sealingly engage with the shaft of the piston. A further feature of the invention is the provision of a compressible gas between the end of the cylinder and the end of the piston so that the expansion thereof reduces the work required to move the piston out of the cylinder, whereas when the system is relaxing, the compressible gas provides extra resistance and thus a smoother motion.

Britton Price Limited, WO 00/32932 describes a reversibly actuatable fluid hydraulic pump for use in a hydraulically driven elevator. The pump comprises a cylinder and a piston linearly actuatable within the cylinder by means of a ball screw race disposed over a spindle

and connected to the piston. The shaft of the piston is hollow to receive the spindle as the piston is drawn along by virtue of the motion of the race along said spindle, and seals are provided at the free end of the piston which sealingly engage against the walls of the cylinder, and on the cylinder which sealingly engage with the shaft of the piston. A further feature of the invention is the provision of a compressible gas between the end of the cylinder and the end of the piston so that the expansion thereof reduces the work required to move the piston out of the cylinder, whereas when the system is relaxing, the compressible gas provides extra resistance and thus a smoother motion.

ISCO, Inc., WO 02/068954 describes a plurality of pumps each having a corresponding one of a plurality of pistons and a corresponding one of a plurality of cylinders are driven by one motor to draw and pump solvent simultaneously into corresponding columns. To form a gradient, the pumps are connected to two-way valves that are connected alternately to a first solvent and a second solvent, whereby the time said valve is in a first position controls the amount of solvent drawn from the first reservoir into said pumps and the amount of time in said second position controls the amount of said second solvent drawn from the second reservoir into said pumps and the solvent is mixed in the pumping systems. The detectors are photodiodes mounted to light guides in the flow cells that generate signals related to light absorbance and communicate with a controller, whereby the controller receives signals indicating solute between the light guides and causes collection of solute. An over-pressure system compensates for pressure over a predetermined level.

As clearly understood in Figs.1 and 1A, the instant invention uses two lead screws for actuating piston type pumping cylinders working in a push-pull arrangement, that is, as one screw drives one piston downward, the other screw drives the other piston upward. The novelty here is two-fold; first, the lead screws extend into the cylinders so as to enable the device to be made in a compact manner, and second, a double pole fluid switch enables a working fluid to be drawn into the cylinders alternately as they meter the fluid in a second half of each cycle. Snodgrass et al teaches the use of two pumping stations set in series, Nichols et al teaches neither of the two above described features as can be seen in Figs. 3-5, wherein the lead screws are mounted at the distal ends of the pistons, and the fluid switch is a

single pole device. Murasubaki et al teaches a single collinear arrangement with simple on/off valves. Ganzel is only remotely related to the present invention. Eden at al teaches a ball screw pump which does not have the advantages described for the present invention. Strohmeier et al teaches a pair of ball screw type pumps in series connection, each with its own drive. The instant invention is a push-pull type with mechanical interconnection such that each piston always operates in opposition to the other. This is a critical feature because of the double pole switch. Patterson et al and Hutchins et al also are each a series arrangement. PCT to Britton Price Ltd teaches dual valves in parallel and a hydraulic pump rather than a screw type. PCT to ISCO Inc. teaches plural liquid piston type dispensing pumps arranged in parallel and draws a fluid simultaneously into several of the pumps. Separate two-way valve are used. Time is used to control the amount dispensed.

In summary, in accordance with the above remarks, we find that the instant invention clearly distinguishes over the foregoing references found in our preliminary patentability search with respect to 35 USC 102. Additionally, we find that no combination of elements borrowed from these references, under 35 USC 103 could be construed to teach the instant invention with respect to the teaching of the piston and screw structure and the two-pole switch arrangement so that one pump is loading as the other is dispensing at all times. The two-pole switch permits fast, uninterrupted action in which error or out of synch operation is impossible.

Check No. 1856 including an amount of $130.00 to cover the required fee for a 37 C.F.R. Section 1.102(d) petition, for a small entity, is enclosed herewith. Please advise if any additional fees are required, or overpayment refund due.

In view of the above, applicant hereby petitions that the above-cited application be made special and advanced for examination, and applicant advised thereof.

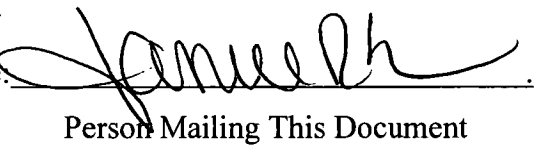
Very respectfully,

Gene Scott, 37,930 Agent of record

Please direct all communications to Customer Number 22197: Mr. Gene Scott, Patent Law & Venture Group, 3140 Red Hill Avenue, Suite 150, Costa Mesa, CA 92626-3440. Phone: (714) 668-1900; Fax: (714) 668-0583

CERTIFICATION

I hereby certify that this correspondence is being deposited with the United States Postal Service as Express mail in an envelope addressed to: "Mail Stop: Petitions, Commissioner For Patents, PO Box 1450, Alexandria, VA 22313-1450," on 12/19/03 date of deposit.

Signature: 

Person Mailing This Document